

PCT

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

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(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 750.0001PCT	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US02/25217	International filing date (day/month/year) 07 August 2002 (07.08.2002)	Priority date (day/month/year) 08 August 2001 (08.08.2001)
International Patent Classification (IPC) or national classification and IPC IPC(7): C01B 21/04 and US Cl.: 423/239.1		
Applicant CEMENT INDUSTRY ENVIRONMENTAL CONSORTIUM		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>2</u> sheets.</p>		
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 21 February 2003 (21.02.2003)	Date of completion of this report 05 April 2004 (05.04.2004)	
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer <i>Henry D. Johnson</i> Edward M. Johnson Telephone No. 571-272-0987	

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☒ the international application as originally filed.
- ☒ the description:  
pages 1-7 as originally filed  
pages NONE filed with the demand  
pages NONE filed with the letter of \_\_\_\_\_.
- ☒ the claims:  
pages NONE as originally filed  
pages NONE as amended (together with any statement) under Article 19  
pages 8 and 9 filed with the demand  
pages NONE filed with the letter of \_\_\_\_\_.
- ☒ the drawings:  
pages 1-2 as originally filed  
pages NONE filed with the demand  
pages NONE filed with the letter of \_\_\_\_\_.
- ☐ the sequence listing part of the description:  
pages NONE as originally filed  
pages NONE filed with the demand  
pages NONE filed with the letter of \_\_\_\_\_.

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**  
These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages NONE
- ☐ the claims, Nos. NONE
- ☐ the drawings, sheets/fig NONE

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. STATEMENT**

Novelty (N)

Claims 1-19 YES  
Claims NONE NO

Inventive Step (IS)

Claims NONE YES  
Claims 1-19 NO

Industrial Applicability (IA)

Claims 1-19 YES  
Claims NONE NO**2. CITATIONS AND EXPLANATIONS**

Claims 1-19 lack an inventive step under PCT Article 33(3) as being obvious over Breen et al. US 5,746,144.

Breen '144 discloses a method for NO<sub>x</sub> reduction by upper furnace injection of urea, lime, and formed HCN (see column 2, lines 17-40).

Breen '144 fails to disclose introduction at 1200-1700 degrees Fahrenheit.

It is considered that it would have been obvious to one of ordinary skill in the art at the time the invention was made to introduce the stream of Breen '144 at 1700 degrees Fahrenheit because Breen '144 discloses introduction at "about 1800" degrees Fahrenheit and that adjustments can be made to accommodate different furnace conditions (see column 5, lines 49-52 and column 6, lines 49-53), which would be obvious, to one of ordinary skill, suggest temperatures in a range at least including 1700 degrees Fahrenheit.

Nothing is disclosed that would suggest that the oxidation is "indirect" and therefore direct oxidation would have also been obvious.

Claim 1-19 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

----- NEW CITATIONS -----

**AMENDED CLAIMS**

[received by the International Bureau on 19 February 2003 (19.02.03);  
original claims 1-20 replaced by new claims 1-19 (2 pages)]

1. A method of reducing nitrogen oxides from an air stream, comprising:  
directly introducing cyanide into the air stream at a temperature between 1200° F and  
1700° F; and  
reacting the cyanide with the nitrogen oxides.
2. The method of claim 1, wherein the reacting step occurs at a temperature between  
1200° F and 1640° F.
3. The method of claim 2, wherein the cyanide is contained in a waste material.
4. The method of claim 3, wherein the waste material comprises ammonia.
5. The method of claim 3, wherein the nitrogen oxides are produced by a cement  
manufacturing process.
6. The method of claim 5, further comprising the step of producing the air stream at least  
in part by burning a raw material mixture in a kiln.
7. The method of claim 6, further comprising using mineral residue from the waste  
material as part of the cement manufacturing process.
8. A method of reducing nitrogen oxides released by a cement manufacturing process,  
comprising:  
burning a raw material mixture in a kiln thereby producing a gas comprising a  
nitrogen oxide compound;  
directly introducing a cyanide containing waste into the cement manufacturing  
process at a temperature between 1200° F and 1700° F; and  
reacting the cyanide containing waste with the gas oxides.
9. The method of claim 8, wherein the cement manufacturing process comprises a pre-  
heating step, and the cyanide containing waste is introduced during the pre-heating  
step.
10. The method of claim 9, wherein the step of reacting occurs during the pre-heating  
step.

11. The method of claim 10, wherein the step of reacting further occurs at a temperature between 1200° F and 1640° F.
12. The method of claim 8, further comprising a step of deriving the cyanide containing waste from aluminum production.
13. The method of claim 12, wherein the cyanide containing waste further comprises ammonia.
14. The method of claim 8, further comprising the step of deriving the cyanide from a mining process.
15. The method of claim 8, wherein the nitrogen oxide compound is nitrogen dioxide.
16. The method of claim 8, further comprising a step of causing a reduction in the amount of the nitrogen oxide compound released from the cement manufacturing process.
17. A cement manufacturing system, comprising:  
a kiln that burns raw materials thereby producing a gas comprising a nitrogen oxide compound;  
a pre-heater tower coupled to the kiln; and  
a cyanide containing waste that is directly introduced into a pre-heater tower at a temperature between 1200° F and 1700° F, such that the cyanide reacts with the gas to reduce the nitrogen oxide compound.
18. The system of claim 17, wherein the cyanide containing waste is derived from mining waste.
19. The system of claim 18, further comprising a waste input port to the pre-heater tower for introduction of the cyanide containing waste into the pre-heater tower.